

Article

Despite Food Insecurity, University Students Remain Committed to Achieving Their Academic Goals: Cross-Sectional Single-Center Study in Saudi Arabia

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Abstract: Food insecurity is a pressing global concern affecting individuals across all age groups. Despite its widespread impact, a notable gap remains in the literature, particularly in reference to the literature concerning university students. This study aimed to assess the prevalence of food insecurity and examine its associated factors, including mental and general health and academic performance, among university students in Jeddah, Saudi Arabia. A total of 421 students from King Abdulaziz University participated in this study, completing a questionnaire that measured food insecurity, academic performance, and mental and general health. About 40% of the respondents experienced some level of food insecurity, which was categorized as mild (20.4%), moderate (13.0%), or severe (5.6%). Significant associations were observed between food insecurity and monthly household income ($p < 0.001$) and general health ($p < 0.005$), respectively. However, the associations were weaker between food insecurity and perceived stress ($p < 0.066$) and the impact of COVID-19. Notably, no significant correlation was found between food security and socio-demographic characteristics or academic performance. This study highlights the prevalence of food insecurity among university students in Saudi Arabia and emphasizes the need for further research to gain a better understanding of its complexities. Such insights can empower universities and policymakers to implement targeted interventions, thereby enhancing the learning experience and future success of university students.

Keywords: food insecurity; COVID-19; universities; mental health; academic performance



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1. Introduction

Food insecurity affects individuals across various demographic groups, and is not solely determined by poverty [1]. It is defined as the “limited or uncertain availability of nutritionally adequate and safe foods, or the limited or uncertain ability to acquire acceptable foods in socially acceptable ways” [2]. Food insecurity negatively affects physical and mental health, increasing the likelihood of chronic diseases and mental health issues [3–8]. In 2020, 10.5% (13.8 million) and 8.8% (1.2 million) of U.S. and Canadian households, respectively, experienced food insecurity. Saudi Arabia is ranked 44th on the Global Food Security Index 2021 [9]. A study conducted in Saudi Arabia during the COVID-19 pandemic confirms that the overall prevalence of food insecurity was 38% [10].

The prevalence of food insecurity among university students has earned some attention in the scholarly literature, illustrating that university students may be a relevant vulnerable group [5]. In the U.S., 19–43.5% of university students have been shown to be food insecure [5,11,12]. In developing countries, this proportion is even higher: up to 65% of students in South Africa experienced food insecurity [13]. Several studies have associated food insecurity with university students with low academic performance [5,14,15]. Students’ abilities to excel in academics depend on a healthy diet, and this is compromised by food insecurity [16–18].

King Abdulaziz University provides free education to most students, but some may still rely on their families. While food insecurity among university students is an emerging field of research, the topic remains under-researched in Saudi Arabia. There is limited research on the food security of university students in Saudi Arabia and its impact on academic performance. Investigating stressors such as food insecurity is crucial to ensure academic success for all students. Therefore, this study aims to assess the prevalence of food insecurity and examine its associated factors, including academic performance and mental and general health, among King Abdulaziz University (KAU) students.

2. Materials and Methods

2.1. Research Design and Participants

A quantitative cross-sectional survey was conducted to estimate the prevalence of food insecurity among university students. We considered several related factors, such as mental health, physical health, and academic performance. In 2019, 77,095 students were enrolled at KAU [19]. For this study, the estimated minimum sample size was calculated to be 383, using the following formula: $n = [z^2 \times p \times (1 - p) / e^2] / [1 + (z^2 \times p \times (1 - p) / (e^2 \times N))]$, where $z = 1.96$ for a confidence level (α) of 95%; p = proportion (expressed as a decimal), N = population size, and e = margin of error [20]. Eligible participants included male and female undergraduate and postgraduate students.

2.2. Data Collection

An internet-based self-administered questionnaire was used. Participant sampling was conducted via nonprobability convenience sampling. The questionnaire was distributed via official university emails and social media platforms, specifically, WhatsApp, with the assistance of the deanship of graduate studies. Data were collected between April 2021 and December 2021.

The first section of the online questionnaire provided participants with information about this study's purpose and potential benefits and emphasized that participation was voluntary. The students provided their consent to participation at the end of the section. The questionnaire consisted of five sections: socio-demographic characteristics, food security status, academic performance, general health, and mental health. The questionnaire was translated into Arabic. A pilot study was conducted with a sample of 15 students and four experts in the field of nutrition and food security to evaluate the questionnaire's clarity, length, and content, and to ensure face and content validity.

2.3. Research Measures

Socio-Demographic Characteristics

This section aimed to establish the demographic profile of the participants, with data being acquired on age, gender, nationality, marital status, place of residence, academic level, type of academic program, faculty of study, employment status, source of income (for students), and average monthly household income based on the Saudi Household Income and Expenditure Survey [21,22].

2.4. Assessing Food Security Status

The eight-item food insecurity experience scale (FIES) was used to assess food insecurity, along with follow-up questions included to monitor the impact of COVID-19. FIES has been used globally in food security research [10,23]. The questions focused on the previous 30 days in order to correlate recent experiences with food insecurity. Only A-type follow-up questions were asked (e.g., was this specifically due to the COVID-19 crisis?). Notably, the Arabic version has been previously used in Arab countries, such as Saudi Arabia [24] and Lebanon [25], and has been validated and recognized as reliable ($\alpha = 0.91$) in the Middle East [26]. The questionnaire provides a raw score, which represents the sum of affirmative responses to the eight items and ranges from 0 to 8. To score the responses, they were coded as Yes (1) or No (0), with "do not know" and refusals coded as missing data and excluded

from the analysis. The raw scores were used to assign individuals to one of the following four categories: Food Secure (0), and Mild (1–3), Moderate (4–6), and Severe (7–8) Food Insecurity [27–29].

2.5. Assessing Academic Performance

Academic performance was assessed in two ways. Firstly, participants reported their cumulative GPA, a widely used indicator of academic success. Secondly, the four-item academic progress scale (APS) was used to assess their perceived academic performance, including questions about class attendance, attention span, comprehension of class material, and progress towards timely graduation [30].

The APS and GPA were used to gather information about the participants' overall academic experience. The participants directly reported their cumulative GPA, with responses for the GPA question coded as follows: A = 4.50–5.00; B = 3.75–<4.50; C = 2.75–<3.75; and D = 2.00–<2.75. The APS included four questions, each scored on a four-point scale: Excellent = 4; Good = 3; Fair = 2; and Poor = 1. A higher total score (with possible scores ranging from 4 to 16 points) indicated a better understanding of academic behavior and ability to exhibit positive academic behavior [30]. The two measurement approaches were assessed separately.

2.6. Assessing General Health

General health was assessed using a single-item measure adopted from the General Health Status and Functional Health Status of the Saudi Health Interview Survey [31]. The participants were asked to rate their health as Excellent, Very Good, Good, Fair, or Poor, which were scored as 1, 2, 3, 4, and 5, respectively.

2.7. Assessing Mental Health

The 10-item perceived stress scale (PSS) was used to assess mental health in this study [32]; this scale is designed to measure the degree of stress experienced from life events and assess unpredictability, unmanageability, and the feeling of being overburdened [33]. The PSS version used in this study asked respondents about the frequency of experiencing specific feelings in the previous month, starting with the phrase, "In the last month, how often have you . . .", followed by the following descriptors: "been upset", "felt nervous and stressed", or "felt confident". The Arabic version has been validated, used, and identified as reliable ($\alpha = 0.74$) [34]. The respondents rated items on a 5-point Likert scale, scored as Never (0), Almost Never (1), Sometimes (2), Fairly Often (3), or Very Often (4), with the exception of items 4–8, which used reverse coding.

2.8. Data Analysis

After conducting the online survey using Google Forms and transferring the results to an Excel spreadsheet, the data were cleaned and analyzed using the Statistical Package for the Social Sciences (SPSS 22, SPSS Inc., Chicago, IL, USA). Descriptive statistics, including percentage (%), frequency, mean, and standard deviation, were used to describe the socio-demographic characteristics, prevalence of food insecurity, and other related variables. Frequencies and percentages were used to describe the categorical and ordinal variables, which were examined using a contingency table (unpaired or paired) and goodness-of-fit tests with maximum likelihood and permutations. The mean and standard deviation values were used to describe the continuous variables, and the Cronbach's alpha value was used to measure reliability. Spearman's correlation coefficient (r_s) was used to investigate the relationships between food security and academics and health, and this was followed by simple linear regression to quantify the trends.

3. Results

3.1. Sample Characteristics

Four hundred twenty-one participants responded to the questionnaire. However, 83 participants did not answer every food security question. This left a total of 338 KAU students with complete answers, constituting the final sample for analysis. As summarized in Supplementary Table S1, approximately two-thirds of the participants were female, and nearly all were Saudi. Most were 18–27 years old, single, and living with their parents. Approximately 40% and 75% of the participants were undergraduates or enrolled in public programs (i.e., no fees), respectively. Moreover, three-quarters of the participants were unemployed, and just over 20% had an income of 15,000 SR or higher. For every demographic variable, the number of students differed among groups (i.e., the null hypothesis of equal proportions was rejected; 10 goodness-of-fit tests, p -values < 0.001 ; Supplementary Table S1).

GPA were highly skewed towards better performance; most students in the sample (58.6%) reported an excellent (4.5–5) GPA, and only 3.8% reported a poor (2–2.75) GPA. Relatively few students self-reported poor or fair academic performance (AP), with a much greater proportion of them showing good or excellent progress (goodness-of-fit tests, all p -values < 0.001 , $df = 3$; Supplementary Table S2). For each of the four academic (AP1–4) questions, the overall mean value was 3.13 or higher, and thus generally excellent (as evinced by the upward-skewed frequency distributions). These results are consistent with those obtained for participant GPAs. Students were of similar age irrespective of food security (Kruskal–Wallis test, $H = 1.03$, adjusted for ties, p -value = 0.794, $df = 3$; Supplementary Table S3).

Most participants (35.5%, $N = 120$) reported their general health to be “Very Good”, whereas only ~6% ($n = 20$) reported their health as “Poor” (Supplementary Table S4). Hence, an equal proportion of health outcomes did not hold for the queried sample of 338 students (goodness-of-fit test, likelihood $c^2 = 103.1$, $p < 0.001$, $df = 4$; Supplementary Table S4). Overall, the responses appeared to be log-normally distributed, with a mean (\pm SD) of 2.43 ± 1.12 (median = 2.0, with a CV = 46.3%).

The descriptive statistics (observed frequency) of answers (five to choose from) were not evenly distributed for each of the 10 mental health questions (goodness-of-fit tests, all p -values < 0.001 , $df = 4$; Supplementary Table S5). This is because these distributions were more or less normal, centered on a mean ranging from 1.65 to 2.47.

3.2. Food Security Status of University Students in Jeddah

Figure 1 shows that nearly two-thirds of the 338 students were food-secure during the COVID-19 pandemic, while the rest (~40%) experienced some degree of food insecurity (mild, moderate, or severe). Seven of the eight demographic variables, i.e., excluding age, were not significantly associated with food security status (contingency table tests based on 4999 permutations, all p -values: 0.18–0.87; Supplementary Table S2), the sole exception being monthly income ($c^2 = 40.0$, p -value < 0.001). Therefore, the significant association between students’ monthly income and food security was further investigated. Evidently, students who self-reported as being “food secure” have significantly greater monthly income than those with mild, moderate, or severe food security (FS_CAT of 2, 3, or 4), as shown in Figure 2. This holds whether inferred by comparing the median (Kruskal–Wallis test, $H = 24.7$, adjusted for ties, $p < 0.001$, $df = 3$) or mean (one-way ANOVA, $F_3, 334 = 9.32$, $p < 0.001$) income levels.

3.3. Impact of COVID-19 on Food Security among University Students

Responses obtained before and after the onset of the COVID-19 pandemic were compared. These responses revealed that for food security questions #1–7, significant differences (i.e., an inconsistency) in the treatment outcome were found within subjects (McNemar’s paired test; all c^2 values: 18.9–55.0, exact p -values < 0.0001 ; $n = 164$ –186). A disproportionate number of students experiencing food insecurity (affirmative reply of 1) tended to say that COVID-19 was a contributing factor. The sole exception to this trend was food security

question #8 ($c_2 = 2.77$, p -value = 0.092, $n = 163$). Notably, not all respondents provided a response, because these follow-up questions were optional; in fact, the sample size varied per question.

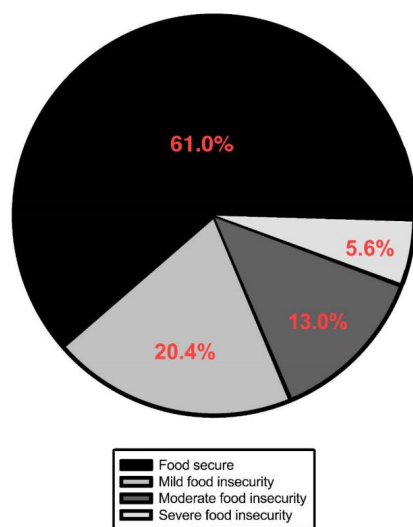


Figure 1. Pie chart showing the uneven proportions of students ($N = 338$) when grouped according to their food security status. The goodness-of-fit test is used to compare the proportions; likelihood chi-square value = 225.1, $p < 0.001$, and $df = 3$. This sample only consists of the participants at King Abdulaziz University (Jeddah, Saudi Arabia) who responded to all the food security questions (#1–8); their summed score is used to classify their status.

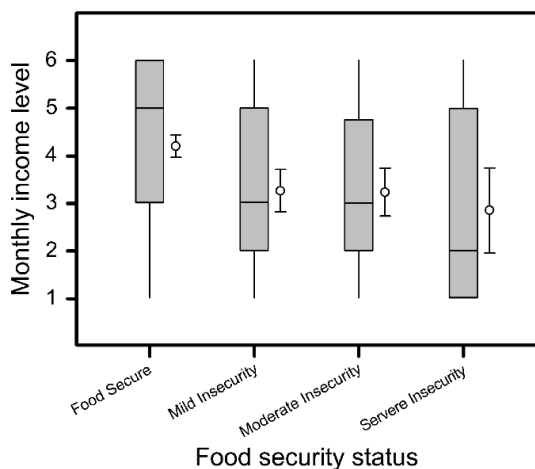


Figure 2. Boxplots of monthly income (ordinal) for the students belonging to the four security categories: Food Secure, and Mild, Moderate, and Severe Food Insecurity. The mean value, with its 95% confidence intervals, is displayed to the right of each boxplot. On the y-axis, the lowest (1) and highest (6) income levels correspond to <4000 SAR and >15,000 SAR per month. (See Supplementary Table S1 for the other income intervals). From left to right, the sample includes 206, 69, 44, and 19 students, respectively, at King Abdulaziz University (Jeddah, Saudi Arabia).

3.4. Linking Food Security to the Academic Performance and Health of University Students

Students who experienced less food security (i.e., a higher summed score out of eight) tended to have poor physical (general) health ($r_s = 0.303$, $p < 0.005$); however, the relationship between the mental health and food security of participants was weaker ($r_s = 0.202$, $p = 0.066$). Higher food security was positively, but non-significantly, associated with greater academic performance ($r_s = 0.051$, $p = 0.097$). Incidentally, these correlations were on par or stronger ($r_s = -0.233$ and -0.345 , $p < 0.001$) with those seen between

academic performance and either measure of health, the former decreasing with the latter (i.e., increasing scores, to 5 or 40, respectively).

We fit bivariate linear regressions to the data to further examine and quantify the relationships of food security with the academic performance and health of the participants. Figure 3 shows that there was extensive scatter (“noise”) in the data for all three relationships (all adjusted R2 values < 0.061). The academic performance of the students hardly changed with their food security (a slope near zero: -0.067 , adj. R2 = 0.001; Figure 3a). In contrast, the physical (i.e., positive slope) (adj. R2 = 0.023; Figure 3b) and mental (adj. R2 = 0.06; Figure 3c) health of the students deteriorated with increasing food insecurity ($p < 0.005$).

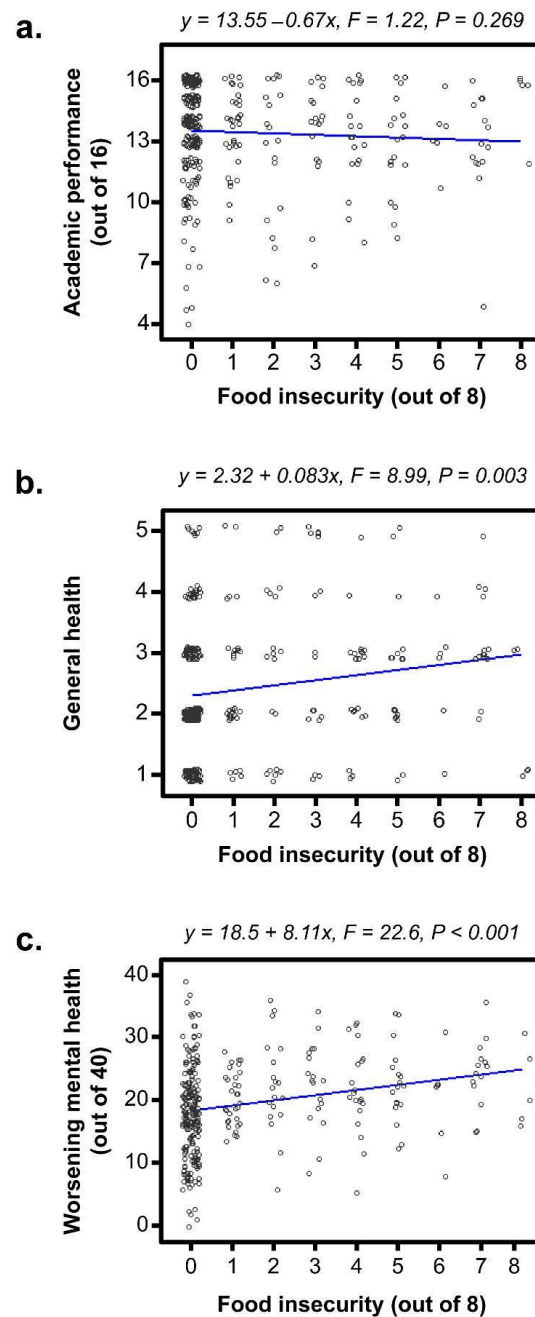


Figure 3. Regressions showing how academic performance (a), physical health (b), and mental health (c) are related to food security among 338 students at King Abdulaziz University (Jeddah, Saudi Arabia). The data points are “jittered” to prevent overplotting from non-unique values (using the Minitab v14 software).

4. Discussion

This study aims to assess the prevalence of food insecurity and examine its associated factors, including academic performance, mental health, and general health, among university students. The findings indicate that two-thirds of the respondents were food-secure, while around 40% fell into different food insecurity categories, with the largest being the subgroup experiencing mild food insecurity (20.4%), followed by the subgroup experiencing moderate food insecurity (13.0%). Comparisons with existing research reveal a higher prevalence of food insecurity in this study (~40.0%) compared to studies on the general Saudi population (37.7%) [10] and a study conducted on university students in Lebanon (9%) [35]. Studies conducted on students in the U.S. reported varying levels of food insecurity, generally lower than those observed in this study and other studies on university students in the Middle East, with prevalence rates ranging from 17% [36] to 34.5% [5,37]. However, the estimated level of food insecurity reported in this study is considerably lower than those reported for university students in South Africa (65%) and Nigeria (80.7%) [11,38].

The unique prevalence of food insecurity among students in Saudi Arabia could be attributed to several reasons. First, unlike many universities worldwide, King Abdulaziz University does not require tuition fees from most students in public programs and provides monthly stipends to Saudi students. Second, university students may have varying levels of financial dependence on their families. The COVID-19 crisis might have exacerbated this situation by causing a loss of income for many individuals, thereby affecting their families' finances, and subsequently impacting the food security of student family members [10,39].

This study found no significant associations between food insecurity and various socio-demographic factors, such as age, gender, nationality, marital status, place of residence, academic level, program type, faculty of study, employment status, and source of income. A study conducted in Portugal found similar results, with no significant associations found with age, gender, employment status, or education level [40]. However, this observation is contrary to previous studies that reported associations between food insecurity and these variables [5,13,37,41]. Several factors may contribute to this disparity. First, our sample size is considerably smaller, compared to previous studies. Second, previous studies often focused on specific groups, such as first-year students or undergraduates, whereas this study included both undergraduate and graduate students. Therefore, future research should aim to use random sampling techniques and gather a larger sample size to help identify potential associations that were not significant due to the limited sample size, thereby enhancing the generalizability of the findings and alleviating selection bias. Moreover, qualitative research is required to gain a better understanding of the food security status of students and the factors influencing food insecurity. A longitudinal study may provide a better understanding into how food insecurity and its determinants develop over time. While not statistically significant, certain factors were more prevalent among students who experienced food insecurity. In this study, female students exhibited higher levels of food insecurity, compared to their male counterparts. This may be attributed to the financial dependency of many females in the Arab region on their families, impacting their ability to purchase food independently. Additionally, undergraduate students and those who were unemployed were more likely to experience food insecurity. The economic repercussions of the COVID-19 pandemic, such as reduced income and increased unemployment rates, likely exacerbated these conditions. Furthermore, the pandemic-induced financial strain on students' families likely contributed to food insecurity.

This study shows a correlation between household income and food insecurity, revealing that lower income levels are associated with higher rates of food insecurity. These findings align with a previous study [42] that reports how financial challenges, particularly low income, negatively affect individuals' food security status, extending to the household level. Individuals in such households often struggle to meet their basic food needs, as financial resources are allocated to more pressing priorities, such as rent payments. Financial

strains exacerbated by the COVID-19 pandemic further compounded the challenges faced by low-income households, amplifying the severity of their food insecurity [43].

Our findings show a significant correlation between COVID-19 and food insecurity among university students. Those experiencing severe food insecurity were notably more likely to be affected by the pandemic, exacerbating their already precarious food security status. These findings are consistent with previous studies conducted on university students in the U.S. which indicate the negative impact of COVID-19 on food security [36,37]. Several factors contributed to this phenomenon. Firstly, the shift to virtual learning during the pandemic may have disrupted students' access to affordable meals provided by university dining facilities, which traditionally offer substantial food options at reduced costs. Secondly, the pandemic-induced economic downturn likely strained students' finances, through either reduced work opportunities, diminished family income, or job loss [44]. Lastly, challenges such as increased food prices, limited access to supermarkets due to curfew restrictions, and reliance on delivery services to minimize COVID-19 exposure, particularly among students living alone, likely compounded the difficulties faced in maintaining food security [45]. Overall, these findings underscore the multifaceted impact of COVID-19 on food insecurity among university students, necessitating targeted interventions to mitigate adverse effects. Therefore, universities and colleges must prepare for future pandemics and disasters. It is critical to plan strategies that address food insecurity among university students. For instance, universities could establish annual screening, especially for new students, to develop interventions that could better support vulnerable university students, such as food assistance programs and educational courses on budgeting and obtaining an affordable nutritious diet. Universities could also establish food banks to ensure that students do not face food insecurity during crises, when institutional resources become unavailable. Incorporating these recommendations into future planning can help alleviate the impacts of pandemics and disasters on food security among university students and ensure they receive the assistance needed to maintain their health and well-being during crises.

Moreover, this study indicates a significant association between the food security status and the mental health of students. This agrees with the results of previous studies reporting higher levels of stress among food-insecure students compared to their food-secure counterparts [5,42,46]. This could be due to the direct stressors imposed by food insecurity, which compound existing psychological burdens faced by students. Factors such as limited access to a diverse or sufficient food supply and concerns about financial constraints in purchasing food may have been exacerbated by the COVID-19 pandemic, which saw notably increased rates of depression, stress, and anxiety among individuals [47]. Additionally, food-insecure students reported poorer overall health compared to their food-secure counterparts, aligning with the findings of previous studies on students and young adults [48,49]. Consequently, food insecurity may negatively influence the overall health of students and exacerbate existing health conditions. Students experiencing high levels of food insecurity may reduce or limit the variety of food consumed, consuming inexpensive and highly processed foods that lack essential nutrients, potentially leading to both weight gain and weight loss, and that cause several diseases.

No correlation was found between students' food security and GPA or APS scores, contrasting with previous research [5,30,50] which reports that food-insecure students have lower GPAs and APS scores than food-secure students. There are several likely explanations for this discrepancy. First, KAU stipulates high grades as a requirement for admission, and high grades must be subsequently maintained; therefore, students are required to study hard despite hardships. Second, students experiencing food insecurity may, in the future, use the experience as motivation to acquire high grades to secure a job, mitigating their current situation. Furthermore, although self-reporting of academic performance has been used in multiple studies, it remains a debatable method [51], as it permits students to intentionally or unintentionally self-report incorrect GPAs.

To the best of our knowledge, this study is the first to assess the prevalence of food insecurity and its associated factors among university students in Saudi Arabia. However, some limitations were encountered in the analysis. Firstly, the cross-sectional design only enabled it to examine the associations between food insecurity and the associated factors, not the casual factors [52]. Secondly, the online questionnaire relied heavily on self-reporting, which could potentially lead to response and recall biases. The sample size was relatively small and did not include students from all faculties; therefore, it might not be representative of the entire student population at KAU. However, similar low response rates have been reported by other studies conducted to determine the food insecurity prevalence among college students [53–55]. Finally, the findings cannot be generalized to university students across Saudi Arabia due to the potential selection bias from using convenience sampling.

5. Conclusions

This study reveals a high prevalence of food insecurity among university students, confirming that food insecurity is a significant issue for university students in Saudi Arabia. Food insecurity appears to be correlated with the monthly household income, mental and general health, and the COVID-19 pandemic. University students who experienced higher food insecurity reported lower monthly household incomes, higher stress levels, and poorer mental and general health. However, no significant associations were found between food security and other socio-demographic characteristics or academic performance. Further research which uses random sampling techniques and has a larger sample size should evaluate food insecurity and its associated factors in greater detail and enhance the generalizability of the findings. Moreover, qualitative research is required to gain a better understanding of students' food security, which could inform efforts by universities and policymakers to enhance food security and improve the overall learning experience of university students, thus fostering academic success.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/soc14070112/s1>, Table S1. Descriptive characteristics and educational information associated with the student participants (N = 338); Table S2. Sample distribution stratified by food security status of student participants during COVID-19 in Saudi Arabia; Table S3. Observed counts and proportions for answers to four questions about the academic performance of the students (N = 338), and their overall score value (1–4); Table S4. Descriptive statistics associated with the general health of the student participants; Table S5. Observed counts and proportions for answers to 10 questions about the mental health of the students (N = 338), and their overall score value (0–4).

Author Contributions: Conceptualization: M.A.H., R.K.K.; Data curation: R.K.K.; Formal Analysis: R.K.K.; Investigation: M.A.H., R.K.K.; Methodology: M.A.H., R.K.K.; Project administration: M.A.H., R.K.K.; Resources: M.A.H., R.K.K.; Software: M.A.H., R.K.K.; Supervision: M.A.H.; Validation: M.A.H.; Visualization: M.A.H., R.K.K.; Writing—original draft: R.K.K.; Writing—review & editing: M.A.H., R.K.K. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in this study. Written informed consent has been obtained from the patients to publish this paper.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors upon request.

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References

- Gundersen, C. Food insecurity is an ongoing national concern. *Adv. Nutr.* **2013**, *4*, 36–41. [CrossRef] [PubMed]
- Anderson, S.A. Core indicators of nutritional state for difficult-to-sample populations. *J. Nutr.* **1990**, *120* (Suppl. 11), 1559–1600. [CrossRef] [PubMed]
- Coffino, J.A.; Spoor, S.P.; Drach, R.D.; Hormes, J.M. Food insecurity among graduate students: Prevalence and association with depression, anxiety and stress. *Public Health Nutr.* **2021**, *24*, 1889–1894. [CrossRef] [PubMed]
- Darling, K.E.; Fahrenkamp, A.J.; Wilson, S.M.; D’Auria, A.L.; Sato, A.F. Physical and mental health outcomes associated with prior food insecurity among young adults. *J. Health Psychol.* **2017**, *22*, 572–581. [CrossRef] [PubMed]
- El Zein, A.; Shelnutt, K.P.; Colby, S.; Vilaro, M.J.; Zhou, W.; Greene, G.; Olfert, M.D.; Riggsbee, K.; Morrell, J.S.; Mathews, A.E. Prevalence and correlates of food insecurity among U.S. college students: A multi-institutional study. *BMC Public Health* **2019**, *19*, 660. [CrossRef] [PubMed]
- Gregory, C.A.; Coleman-Jensen, A. *Food Insecurity, Chronic Disease, and Health Among Working-Age Adults*; Economic Research Report, 235; United States Department of Agriculture, Economic Research Service: Washington, DC, USA, 2017.
- Jones, A.D. Food insecurity and mental health status: A global analysis of 149 countries. *Am. J. Prev. Med.* **2017**, *53*, 264–273. [CrossRef] [PubMed]
- Martinez, S.M.; Grandner, M.A.; Nazmi, A.; Canedo, E.R.; Ritchie, L.D. Pathways from food insecurity to health outcomes among California University students. *Nutrients* **2019**, *11*, 1419. [CrossRef] [PubMed]
- Economist Intelligence Unit (EIU). Global Food Security Index 2021, Rankings and Trends. 2021. Available online: <https://impact.economist.com/sustainability/project/food-security-index/Index> (accessed on 12 December 2021).
- Mumena, W. Impact of COVID-19 Curfew on eating habits, food intake, and weight according to food security status in Saudi Arabia: A retrospective study. *Prog. Nutr.* **2020**, *22*, e2020075. [CrossRef]
- Morris, L.M.; Smith, S.; Davis, J.; Null, D.B. The prevalence of food security and insecurity among Illinois university students. *J. Nutr. Educ. Behav.* **2016**, *48*, 376–382.e1. [CrossRef] [PubMed]
- Nazmi, A.; Martinez, S.; Byrd, A.; Robinson, D.; Bianco, S.; Maguire, J.; Crutchfield, R.M.; Condron, K.; Ritchie, L. A systematic review of food insecurity among US students in higher education. *J. Hunger Environ. Nutr.* **2019**, *14*, 725–740. [CrossRef]
- Van den Berg, L.; Raubenheimer, J. Food insecurity among students at the University of the Free State, South Africa. *S. Afr. J. Clin. Nutr.* **2015**, *28*, 160–169. [CrossRef]
- Phillips, E.; McDaniel, A.; Croft, A. Food insecurity and academic disruption among college students. *J. Stud. Aff. Res. Pract.* **2018**, *55*, 353–372. [CrossRef]
- Van Woerden, I.; Hruschka, D.; Bruening, M. Food insecurity negatively impacts academic performance. *J. Public Aff.* **2019**, *19*, e1864. [CrossRef]
- Burns, C.; Kristjansson, E.; Harris, G.; Armstrong, R.; Cummins, S.; Black, A.; Lawrence, M. Community level interventions to improve food security in developed countries. *Cochrane Database Syst. Rev.* **2010**, *2024*, CD008913. [CrossRef]
- Florence, M.D.; Asbridge, M.; Veugelers, P.J. Diet quality and academic performance. *J. Sch. Health* **2008**, *78*, 209–215; quiz 239. [CrossRef] [PubMed]
- Taras, H. Nutrition and student performance at school. *J. Sch. Health* **2005**, *75*, 199–213. [CrossRef] [PubMed]
- King Abdul Aziz University (KAU). Our History. 2019. Available online: <https://www.kau.edu.sa/Pages-%D8%AA%D8%A7%D8%B1%D9%8A%D8%AE%D9%86%D8%A7.aspx> (accessed on 30 March 2020).
- Dean, A.G.; Sullivan, M.J.; Soe, M.M. OpenEpi: Open Source Epidemiologic Statistics for Public Health, Version. 2013. Available online: https://www.openepi.com/Menu/OE_Menu.htm (accessed on 19 December 2022).
- General Authority for Statistics Kingdom of Saudi Arabia. Household Income and Expenditure Survey. 2018. Available online: <https://www.stats.gov.sa/en/37> (accessed on 31 January 2022).
- Human Resources and Social Development (HRSD). M. Al-Rajhi Issues a Ministerial Decision to Raise the Minimum Wage for Calculating Saudis in (Nataqat). 2020. Available online: https://www.my.gov.sa/wps/portal/snp/content/news/newsDetails/CONT-news-241120201/!ut/p/z1/jZFbT4NAEIV_DY-wM8tF4htCvRBhJQXEFfTgKJJBQlgC66b93UxuTemk7bzP5zsnMGcJQfhQfnRNuXRiKHvVv3DnNXxyLfQAmQvJChL_wEeTpgDMic97IMYV3KOFDCx6C0kQeLGdYoi5Q_gl-m-AmfANAqIr5q1zBLAv08M_5cE5_boeSHgOUinQKfKjhvCxXFq9GzaCFD6LU32o5axTC5ECBVTr8GMzdhdaygwzaoc5gG8dgFOJ_XD4HckeOHGzOqjpRfX1P2-oTFdtPtWbeqon431S43ZZxvlaAw2kIEYjRNPXxpvYavCXpBXzQopjkozblCvkzoTuQefVTn4CUC-IJA!!/dz/d5/L2dBISEvZ0FBIS9nQSEh/ (accessed on 31 January 2022).
- Pool, U.; Dooris, M. Prevalence of food security in the UK measured by the food insecurity experience scale. *J. Public Health* **2022**, *44*, 634–641. [CrossRef] [PubMed]
- Althumiri, N.A.; Basyouni, M.H.; Duhaim, A.F.; AlMousa, N.; Aljuwaysim, M.F.; BinDhim, N.F. Understanding food waste, food insecurity, and the gap between the two: A nationwide cross-sectional study in Saudi Arabia. *Foods* **2021**, *10*, 681. [CrossRef] [PubMed]
- Itani, R.; Mattar, L.; Kharroubi, S.; Bosqui, T.; Diab-El-Harake, M.; Jomaa, L. Food insecurity and mental health of college students in Lebanon: A cross-sectional study. *J. Nutr. Sci.* **2022**, *11*, e68. [CrossRef]

26. Naja, F.; Hwalla, N.; Fossian, T.; Zebian, D.; Nasreddine, L. Validity and reliability of the Arabic version of the household food insecurity access scale in rural Lebanon. *Public Health Nutr.* **2015**, *18*, 251–258. [CrossRef]
27. Food and Agriculture Organization of the United Nations (FAO). Applying the FIES. Available online: <http://www.fao.org/in-action/voices-of-the-hungry/using-fies/en/> (accessed on 31 January 2022).
28. Food and Agriculture Organization of the United Nations (FAO). The Food Insecurity Experience Scale. Available online: <http://www.fao.org/in-action/voices-of-the-hungry/fies/en/> (accessed on 31 January 2022).
29. Food and Agriculture Organization of the United Nations (FAO); International Fund for Agricultural Development (IFAD); United Nations International Children’s Emergency Fund (UNICEF); World Food Programme and World Health Organization (WFP). *The State of Food Security and Nutrition in the World 2020, Transforming Food Systems for Affordable Healthy Diets*; Food and Agriculture Organizations: Rome, Italy, 2020.
30. McArthur, L.H.; Ball, L.; Danek, A.C.; Holbert, D. A high prevalence of food insecurity among university students in Appalachia reflects a need for educational interventions and policy advocacy. *J. Nutr. Educ. Behav.* **2018**, *50*, 564–572. [CrossRef] [PubMed]
31. Ministry of Health (MOH). Kingdom of Saudi Arabia. *Saudi Health Interview Survey Results*. 2013. Available online: <http://www.healthdata.org/sites/default/files/files/Projects/KSA/Saudi-Health-Interview-Survey-Results.pdf> (accessed on 31 January 2022).
32. Cohen, S.; Williamson, G. Perceived stress in a probability sample of the United States. In *The Social Psychology of Health: Claremont Symposium on Applied Social Psychology*; Spacapan, S., Oskamp, S., Eds.; Sage Publications: Newbury Park, CA, USA, 1988; pp. 31–67.
33. Cohen, S.; Kamarck, T.; Mermelstein, R. A global measure of perceived stress. *J. Health Soc. Behav.* **1983**, *24*, 385–396. [CrossRef] [PubMed]
34. Chaaya, M.; Osman, H.; Naassan, G.; Mahfoud, Z. Validation of the Arabic version of the Cohen perceived stress scale (PSS-10) among pregnant and postpartum women. *BMC Psychiatry* **2010**, *10*, 111. [CrossRef] [PubMed]
35. Fares, K.; Barada, D.; Hoteit, M.; Abou Haidar, M. Prevalence and correlates of food insecurity among Lebanese University students of Hadath campus. *Atena J. Public Health* **2020**, *2*, 5.
36. Davitt, E.D.; Heer, M.M.; Winham, D.M.; Knoblauch, S.T.; Shelley, M.C. Effects of COVID-19 on university student food security. *Nutrients* **2021**, *13*, 1932. [CrossRef] [PubMed]
37. Owens, M.R.; Brito-Silva, F.; Kirkland, T.; Moore, C.E.; Davis, K.E.; Patterson, M.A.; Miketinas, D.C.; Tucker, W.J. Prevalence and social determinants of food insecurity among college students during the COVID-19 pandemic. *Nutrients* **2020**, *12*, 2515. [CrossRef] [PubMed]
38. Ukegbu, P.; Nwofia, B.; Ndudiri, U.; Uwakwe, N.; Uwaegbute, A. Food insecurity and associated factors among university students. *Food Nutr. Bull.* **2019**, *40*, 271–281. [CrossRef] [PubMed]
39. Almoraie, N.M.; Hanbazaza, M.A.; Aljefree, N.M.; Shatwan, I.M. Nutrition-related knowledge and behaviour and financial difficulties during the Covid-19 quarantine in Saudi Arabia. *Open Public Health J.* **2021**, *14*, 24–31. [CrossRef]
40. Marques, B.; Azevedo, J.; Rodrigues, I.; Rainho, C.; Gonçalves, C. Food Insecurity Levels among University Students: A Cross-Sectional Study. *Societies* **2022**, *12*, 174. [CrossRef]
41. Spaid, R.; Gillett-Karam, R. Food for Thought: Food Insecurity in Women Attending Community Colleges. Forum Public Policy 2018. Available online: <http://forumonpublicpolicy.com/wp-content/uploads/2017/10/Spaid-and-Gillett.pdf> (accessed on 20 January 2022).
42. Ahmad, N.S.S.; Sulaiman, N.; Sabri, M.F. Food insecurity: Is it a threat to university students’ well-being and success? *Int. J. Environ. Res. Public Health* **2021**, *18*, 5627. [CrossRef]
43. Bruce, C.; Gearing, M.E.; DeMatteis, J.; Levin, K.; Mulcahy, T.; Newsome, J.; Wivagg, J. Financial vulnerability and the impact of COVID-19 on American households. *PLoS ONE* **2022**, *17*, e0262301. [CrossRef]
44. Milovanska-Farrington, S. Job loss and food insecurity during the COVID-19 pandemic. *J. Econ. Stud.* **2023**, *50*, 300–323. [CrossRef]
45. Hanbazaza, M. The impact of COVID-19 curfew on food security status, eating habits, and health among adults living in Saudi Arabia: Food security in Saudi Arabia during COVID-19. *Prog. Nutr.* **2021**, *23*, e2021058. [CrossRef]
46. Diamond, K.K.; Stebleton, M.J.; delMas, R.C. Exploring the relationship between food insecurity and mental health in an undergraduate student population. *J. Stud. Aff. Res. Pract.* **2020**, *57*, 546–560. [CrossRef]
47. Nochaiwong, S.; Ruengorn, C.; Thavorn, K.; Hutton, B.; Awiphan, R.; Phosuya, C.; Ruanta, Y.; Wongpakaran, N.; Wongpakaran, T. Global prevalence of mental health issues among the general population during the coronavirus disease-2019 pandemic: A systematic review and meta-analysis. *Sci. Rep.* **2021**, *11*, 10173. [CrossRef]
48. Frank, L. ‘Hungry for an education’: Prevalence and outcomes of food insecurity among students at a primarily undergraduate university in rural Nova Scotia. *Can. J. High. Educ.* **2018**, *48*, 109–129. [CrossRef]
49. Nagata, J.M.; Palar, K.; Gooding, H.C.; Garber, A.K.; Bibbins-Domingo, K.; Weiser, S.D. Food insecurity and chronic disease in US young adults: Findings from the national longitudinal study of adolescent to adult health. *J. Gen. Intern. Med.* **2019**, *34*, 2756–2762. [CrossRef] [PubMed]
50. Martinez, S.M.; Frongillo, E.A.; Leung, C.; Ritchie, L. No food for thought: Food insecurity is related to poor mental health and lower academic performance among students in California’s public university system. *J. Health Psychol.* **2020**, *25*, 1930–1939. [CrossRef]

51. Pike, G.R. Using college students' self-reported learning outcomes in scholarly research. *New Dir. Institutional Res.* **2011**, *2011*, 41–58. [[CrossRef](#)]
52. Setia, M.S. Methodology series module 3: Cross-sectional studies. *Indian J. Dermatol.* **2016**, *61*, 261–264. [[CrossRef](#)]
53. Patton-López, M.M.; López-Cevallos, D.F.; Cancel-Tirado, D.I.; Vazquez, L. Prevalence and correlates of food insecurity among students attending a midsize rural university in Oregon. *J. Nutr. Educ. Behav.* **2014**, *46*, 209–214. [[CrossRef](#)] [[PubMed](#)]
54. Payne-Sturges, D.C.; Tjaden, A.; Caldeira, K.M.; Vincent, K.B.; Arria, A.M. Student hunger on campus: Food insecurity among college students and implications for academic institutions. *Am. J. Health Promot.* **2018**, *32*, 349–354. [[CrossRef](#)] [[PubMed](#)]
55. Nikolaus, C.J.; An, R.; Ellison, B.; Nickols-Richardson, S.M. Food insecurity among college students in the United States: A scoping review. *Adv. Nutr.* **2020**, *11*, 327–348. [[CrossRef](#)] [[PubMed](#)]

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